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Report of Dr. George Turner's Experience of Diphtheria, especially in its relations to Lower Animals, partly obtained in the course of Inspections made for the Local Government Board in 1886.

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Medical Department,
July 2nd, 1887.

Almost nothing is with certainty known of the beginnings of diphtheria, though much has been learned respecting conditions favouring its spread and something, perhaps, of influences fostering its virulence.

The earliest cases in an epidemic of diphtheria are frequently very mild, and thus easily escape recognition. The first persons to die (almost invariably children) are generally supposed to have suffered from "croup," and very likely at commencement of an epidemic diphtheria may be mainly a local disease, killing rather by suffocation than by general "blood poisoning."

In villages and towns diphtheria beginning in the above fashion is, without question, often subsequently propagated by personal communication, especially by association of children in school. And, seemingly, at school slight cases of diphtheria and cases that are convalescent get opportunity for passing on the malady, with great addition of intensity, to other persons. It has been found, too, that when a school has been closed on account of prevalence of diphtheria among the scholars, the disease sometimes recurs again and again after re-opening of the school, as a result of the premature return there of children convalescent or seemingly quite recovered of their illness. Convalescent children do not seem to do much harm in their own families, but as soon as a few of them congregate in school the diphtheria is apt to re-appear with all its old severity. Of other influences tending to enhance severity of diphtheria, unwholesome circumstances of dwellings have been thought of as especially potent. Thus overcrowding, badly-trapped drains, and damp walls and floors have been cited as influencing the course of attacks of the disease unfavourably. In my own experience saturation of the soil under the dwelling with fœcal matter, or with water contaminated by excrement, has appeared a condition especially favourable to development of diphtheria in its most fatal forms.

But cases of diphtheria occur for which neither personal communication nor any of the above conditions can be assigned as probable causes. It is of these that I desire more particularly to speak. They are cases especially difficult to account for, from the very fact that they are confined to one or two families, and we cannot compare the daily life of those who escape and of those who are attacked to see in what respect their lives have differed, and so arrive at the cause of the mischief. Still an attempt at this may be made by comparing a number of isolated cases.

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In regard to cases of the above sort, I am about to raise afresh the question as to probable origination of diphtheria in the human subject by means of lower animals; relating my own experiences in this connexion since 1882, when the matter began to especially engage my attention.

A hypothesis of relation of human diphtheria to disease of lower animals is by no means a gratuitous one. On the contrary, it has much to recommend it. Thus communication of anthrax and glanders from lower animals to man has long ago been established, and we know of transmission to the human subject of scarlatina, diphtheria, and enteric fever by cows' milk. It is true that for years it has been assumed by some persons that these diseases must needs have been communicated from man to man through the medium of milk, rather than directly from the animal to its milk; but recently Dr. Klein has demonstrated that a disease of the cow, causing the animal apparently little or no discomfort, can, when the creature's milk is consumed by human beings, reproduce itself in them as scarlatina, one of the best known and most fatal of infectious disorders. The cow disease here in question is so trivial as to escape the notice of persons accustomed to the care and treatment of cows, and its clinical identity with scarlatina can be altogether denied on veterinary authority. I am encouraged, therefore, in what follows to be content with drawing attention to none but broad clinical and pathological resemblances between maladies of lower animals and diphtheria in the human subject.

That I am unable to demonstrate conclusively the transmission of diphtheria from the lower animals to man, or from man to the lower animals, I am perfectly aware. I have never been in a position to do this experimentally with much chance of success. The evidence I have to offer is only circumstantial, and is therefore open to numberless objections, but it will, I hope, be sufficient to induce medical officers of health who may have opportunities of witnessing the commencement of extensive epidemics, or those single cases which occur in isolated positions amongst persons little exposed to infection in the ordinary way, to take the matter up and inquire into the possibility of the occurrence I am mentioning.

In the year 1882 a *pigeon* was brought to me for dissection. From the history of the symptoms I hoped to find strongles in the trachea, specimens of which I was anxious to obtain. To my surprise, I found the whole of the windpipe covered with a well-marked consistent membrane, which hung loosely in the tube like a windsail, just as one may see it in the body of a child who has died of croup.

A person, whose name I need not mention, inoculated pigeons in the fauces with this membrane. A disease of a similar character resulted, showing that the disorder was communicable, and he noticed that the affection extended up into the eye of the pigeon through its nostrils.

In 1883 an epidemic of diphtheria occurred in the village of Braughing. The first cases were connected with a farm on which the *fowls* were dying of a disease seemingly identical with that above referred to as affecting pigeons; and diphtheria made its appearance on other farms, where it was also preceded by a similar affection amongst the fowls.

I subsequently noticed the same association in other instances, and during the summer of 1886, while making inquiries, for the Local Government Board, into the circumstances attending epidemic diphtheria at Farnham, I found that the fowls had been affected at the same time as human beings in Aldershot, where a veterinary surgeon dissected some chicken and noticed the presence of a membrane in the trachea. It had occurred too amongst *turkeys* and fowls at Ash; at Long Eaton in Derbyshire it had been very prevalent; while at Tongham and its neighbourhood (in Surrey) it caused great havoc amongst chicken and *pheasants*.

At the last-mentioned place a gamekeeper employed rearing game and chicken described very clearly the appearances he had noticed in his birds; the white crusts round the beaks, the patches in the throat, the invasion of the eyes and nostrils, and the absence of strongles,* *Sclerostoma syngamus*.

* The possibility of diphtheria amongst fowls being mistaken for strongles or the gapes is very great unless the birds are seen; but only the very young chicken usually succumb to the animal parasite, while numbers of the older birds die from this other disease.

At Tongham, too, a man bought a chicken at a low price from an infected farm, because it was likely to die of this diphtheria-like disease. He took the bird home, and diphtheria itself broke out in his house shortly after; this was the first case in that village. My attention was called to these facts by the medical attendant, and the man himself corroborated the information in all particulars.

I have also seen chicken and pigeons which had been inoculated with diphtheritic membrane from a child's throat attacked with a disease which in all respects resembled what I regard as natural fowl-diphtheria.

Similar accounts are received from abroad,* so that the identity and transmissibility of this disease from fowls to men seems very probable.

My attention was at first directed almost exclusively to what I regarded as diphtheria amongst fowls. I had observed a disease in swine which appeared exactly similar to human diphtheria, and had noticed that at Braughing both the *swine* and *horses* suffered from sore-throat sickness immediately *after* the epidemic amongst the human beings. But until 1886 I had seen no reason for supposing any disease of a similar nature was communicable by swine or horses, or indeed by *cats*, to mankind.

During the month of January 1886, however, I was called upon to investigate an epidemic of diphtheria at Brent Pelham (Herts), and found that in the cottage in which the first cases occurred a *kitten* had previously suffered from a throat affection, which was attended by swelling of the neck, foul discharge from the nostrils, and "running" at the eyes.

Before I arrived on the spot the kitten had died and had been buried. I dug it up, but decomposition had advanced too far to admit of its being employed for purposes of experiment.

Other cats at Brent Pelham were found to have suffered in a like manner. That the animals had not been shot at and wounded was ascertained, because they had been seen and handled; and as far as it was possible I assured myself that they had not been poisoned.

Two cats had died at the general shop in the village; I offered the shopkeeper 10*s.* for a cat suffering in a similar manner, but although one was subsequently attacked he preferred to kill and bury it rather than let me have it. This man subsequently himself suffered.

Similar disease was noticed amongst the cats at Aldershot in Hants, at Farnham and Yateley in Surrey, and at Petersfield in Sussex. In the latter town the evidence was very clear, not that the animal had communicated the disease to certain children, but that it had been infected by them. The cats in a row of houses in which the disease had been prevalent were noticed to be ailing, their throats were swollen and there was discharge from the eyes and nose. Moreover, one woman informed me that when her cat was recovering it experienced a difficulty in taking milk, and that it choked and sneezed when attempting to do so.

At Moulton (Suffolk) some children were ill of diphtheria in a cottage at some distance from the village. They had been infected while attending the village school, and were by the direction of the medical man confined to the upper rooms of their cottage that the other inmates might escape. No food which had been offered to the sick children was set before the others, the mother habitually gave it to the cat. The animal subsequently suffered to such an extent that it became a question whether it had not better be killed; this was not done, and the cat eventually recovered.

At Blackwater (Surrey) I spoke to a medical man in practice there, who told me that he had never remarked any occurrences of the above sort, but would in future make inquiries in that direction. I have subsequently received from him a short note of a case in which children were attacked with diphtheria after their cat had been ill.

(In the British Medical Journal, January 3rd, 1885, there is an account of some experiments by Dr. C. J. Renshaw, who appears to have succeeded in inoculating cats with diphtheria, using for his purpose diphtheria-material from the human subject.)

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* British Medical Journal, Oct. 6th, 1884. Journal d'Hygiène, 1884, p. 411.

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Horses, it is well known, suffer from sore throat, one variety of which is called "strongles"; but diphtheria does not appear to be recognised as a disease occurring amongst them. Without asserting that strongles is in all cases diphtheria, I think it is possible that some of the many diseases classed under that name may have kinship with the human diphtheria disease.

At Moulton the first case of diphtheria at a farmhouse occurred shortly after a horse on the farm had died of strongles; the second was that of a man working on the farm as "horse keeper"; and in the neighbouring village of Ouseden, where a man who had recently recovered from diphtheria was for a short time employed to groom a mare, the animal in question was in a few days affected with "strongles," as shown by much swelling at the angle of the jaws, and a very foul discharge from the nose. At Yateley diphtheria in the human subject was in two instances coincident with "strongles" amongst the horses. Other instances of a similar character have come to my knowledge, and if the nature of the employment pursued by persons (or their parents) who have died of diphtheria be noted, it is surprising what a large proportion will be found to have followed occupations more or less connected with horses, or other of the lower animals. Commonly they are grooms, blacksmiths, or shepherds.

Dr. Ogle informs me that he met with an instance in which diphtheria occurred in a shepherd's family shortly after a throat disease had prevailed amongst the *sheep*. An epidemic at Portsmouth was preceded by a great mortality amongst the *lambs* in the surrounding country, and the reports of the Medical Department of the Local Government Board contain at least one other instance in which it seems probable that diphtheria had been communicated to the human subject by sheep.

At Moulton I was asked to see a flock of sheep and lambs said to be suffering from a throat affection; I formed the opinion that they were suffering from foot-and-mouth disease, but although I have seen that disease very frequently in cattle I have had no experience of it amongst sheep, and may have been mistaken. The shepherd affirmed it was nothing of the kind.

I think there is sufficient evidence to encourage careful inquiry as to connexion between diphtheria in man and throat affections amongst animals. It is a question of great importance, and demonstration of such connexion would help to explain the occurrence of cases of diphtheria in isolated positions where human communication is very restricted. As for instance in the Australian bush, where (as I am informed by a friend residing there) diphtheria sometimes makes its appearance under circumstances which almost preclude any conveyance of infection by human beings or by prevailing winds.

It might explain, too, the great difference we notice in the severity of diphtheria in different epidemics, and make clear other facts concerning which we are at present totally in the dark.

April 1887. GEORGE TURNER.